



Course Plan of general chemistry

Course Title	General Chemistry Code: EMP 013
Academic Year/ Semester	Preparatory 2019 / 2020 First Semester
No. of Hours per week	Lecture: 3 Laboratory: 2 Total: 5
Course Coordinator	Assoc. Prof. Manal Elhefnawy
Course Instructors	Assoc. Prof. Hanaa Abulmagd – Dr. Shahera Shohaieb – Dr. Mohamed Magdy

2. Course Aims

The primary goals of this course are to:

1. understand fundamentals and basic concepts of engineering chemistry.
2. understand the properties of different types of solutions.
3. understand the basics of distillation of liquids mixture based on utilize Raoult's law.
4. understand the technological importance behind the colligative properties of solutions.
5. acquire knowledge about desalination of water based on the reverse osmosis.
6. be familiar with the energy forms and their inter-conversion.
7. calculate the heat content of different chemical and physical processes.
8. estimate the balance of the chemical equation based on their heat.
9. differentiate between the different types of calorimeters used to calculate the heat flow.
10. differentiate between the different types of fuels and calculate their calorific values.
11. understand basics of some chemical industries such as cement and plastics.
12. be familiar with the pollution caused by some selected industries.
13. differentiate between conduction in metals and in electrolytes
14. calculate specific conductance and molar conductivity for electrolyte
15. study conductivity at infinite dilution and Kohlrausch law.
16. drive Ostwald dilution law and study its application.
17. understand acid- base equilibrium and pH calculations.
18. identified buffer solution and Henderson equation.
19. study different types of electrode.
20. drive Nernst equation and calculate EMF of an electrochemical cell.
21. recognize electrochemical corrosion.
22. be able to measure pressure and using different tools for measuring atmospheric pressure.
23. understand the basics of gas laws.
24. differentiate between ideal gas law and real gas law.
25. understand the basics of Equilibrium laws based on pressure or concentration.
26. outlining relation between equilibrium constant in form of conc, and in form of pressure.
27. calculating and comparing equilibrium constant with reaction quotient.

3. Course Contents- Lectures

Week	Topics of Lectures	
1	Introduction, importance of chemistry, matter & its physical states, phase diagram and phase transition.	Energy and its units, Internal energy, state function, The first law of thermodynamics, Thermodynamic processes, P-V Work
2	Vapor pressure and B.P of liquids. Solutions: types, solubility factors & expressions.	Heat content (enthalpy), Enthalpies of reaction, ΔH vs. ΔE
3	Factors affecting solubility of gas in liquid solutions & Henry's law.	Thermochemical equations, Rules of thermochemistry
4	Binary liquids solution, Raoult's laws, ideal & non-ideal solutions, distillation of binary miscible liquids.	Enthalpies of formation & determination of enthalpies of reaction, Hess's law, Bond enthalpy
5	Solution of solids in liquids, Colligative properties and their importance. Osmosis and water treatment (desalination process).	Heat flow, Calorimetry and determination of ΔH & ΔE , coffee cup calorimetry, Bomb calorimetry.
6	Building materials (cement), its manufacture, chemistry, its environmental impacts.	Fuel combustion and its technology
7	A molecular look at gases, measurement of pressure, gas laws	Conduction in metal and in electrolyte, conductivity and molar conductivity, conductivity cell
8	Midterm Exam	
9	Stoichiometry using gas volumes Ideal gas law	Factors affecting conductivity, Kohlrausch, law and its application
10	Dalton's law of partial pressure, Amagat's law of partial volume, Real gases	Ionic mobility and transport no of ions, Ostwald dilution law and its application.
11	Dynamic equilibrium in chemical systems, Equilibrium laws	Acid-base equilibrium and pH calculation, Buffer solution and Henderson equation.
12	Equilibrium laws based on pressure or concentration, equilibrium laws for heterogeneous reactions, position of equilibrium and equilibrium constant	Potential difference at the interfaces, simple electrochemical cell, types of electrode, reference electrodes.
13	Calculating equilibrium constant, Manufacturing of plastic	Nernst equation and calculation of the EMF of cell, electrochemical corrosion.

Course contents- laboratory

Week	Experiment
1	Introduction to chemical laboratory: tools, safety, measuring, units
2	Determination of acid (base) concentration by Titration: HCl Vs. NaOH
3	Determination of acid (base) concentration by Titration: HCl Vs. NaCO ₃ .
4	Determination of acid (base) concentration by pH
5	Revision on titration
6	Determination of enthalpy of neutralization
7	Determination of the rate of a reaction
8	Midterm exam
9-11	Determination of acidic radicals of salts
12	Revision on salts
13, 14	Final exam of chemistry lab

4. Assessment Details

Methods of Assessment	Grading Mode	Weighting %	Outline Details
Mid-Term Exam	30	20%	Week 8: 1 hour
Laboratory test	30	20%	Week 13, 14: 1 hours
Final Exam	90	60%	Week 15: 3 hours

5. References:

Course Notes: Engineering Chemistry (Part 1): Assoc. Prof. Hanaa Abulmagd – Dr. Shahera Shohaieb, (Part 2): Assoc. Prof. Manal Elhefnawy- Dr. Fadwa Hashim

1. **Recommended Books:** Atkins & De Poula, J, physical chemistry 8th edition, 2006.
2. Ralph H. Petrucci, F. Geoffrey Herring, Jeffry D. Madura, Carey Bissonnette, “General Chemistry: Principles and Modern Applications”, 10th Edition”, Pearson Prentice Hall, 2011.

Course instructors:

Assoc. Prof. Manal Elhefnawy
Assoc. Prof. Hanaa Abulmagd
Dr. Shahera Shohaieb
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